FIVE FURTHER ABARE SCENARIOS

Important Note for Readers

A further five ABARE scenarios were commissioned following the completion of the six-scenario ABARE report, *Economic Outcomes of the Kyoto Protocol for New Zealand* (available on the climate change website), which was publicly released in November 2001 during the period of public consultation on ratification of the Kyoto Protocol and on domestic policy options.

The purpose of *Economic Outcomes of the Kyoto Protocol for New Zealand* was to identify:

(i) the effects on New Zealand's international competitiveness of US and possible Australian non-participation in the Protocol; and

(ii) the effects on New Zealand's agriculture and energy sectors of identical and differentiated application of a price on greenhouse gas emissions.

At the time of preparation of that report, a need was identified for economic modelling of policies that did not involve use of a domestic emissions pricing regime at the full international price. This would provide information on the theoretical possibility of using removal units (sink credits) and/or general taxation (GST) as ways of meeting obligations.

These results were not available during the October-December period when public consultation was carried out, but were incorporated in the National Interest Analysis (also available on the climate change website), which was tabled in Parliament on 13 February 2002.

ABARE does not consider this work to be a full publication-ready report. Due to the time constraints imposed by the policy development process, they were not asked by officials to provide such a report.

However, the following note outlines the scenarios and the results obtained. The interpretation in the note is that of officials with assistance from ABARE. Also attached are the spreadsheets setting out the results for each scenario.

Five further ABARE scenarios

Introduction

In October 2001 the New Zealand Ministry of Agriculture and Forestry requested ABARE to undertake analysis of five scenarios as part of its pre-ratification assessment of the Kyoto Protocol. These scenarios focus on three issues of importance to New Zealand (table 1). They are:

- the extent to which New Zealand is exposed to the global carbon charge, given that carbon sequestration in New Zealand under Article 3.3 of the protocol is projected to reduce net greenhouse gas emissions in New Zealand to below its Kyoto emission target;
- the extent to which the iron and steel and nonferrous metals industries are exposed to any domestic carbon charge that is introduced in New Zealand; and,
- the potential for raising the tax on final domestic consumption in New Zealand to finance the purchase of sink credits under Article 3.3 by the New Zealand government for use in meeting its Kyoto emission target.

Table 1: Description of scenarios modeled in this study

Scenario	Description of scenario
1	The Kyoto Protocol is implemented with full emissions trading but without US participation. The New Zealand government does not introduce a carbon charge but uses sink credits under Article 3.3 to achieve its Kyoto emission target. New Zealand's remaining sink credits are sold on the international emission quota market.
2	As in scenario 1 but the New Zealand government raises the tax on final domestic consumption to purchase emission quota for meeting its Kyoto emissions target. All of New Zealand's sink credits under Article 3.3 are sold on the international emission quota market.
3	As in scenario 1 but the New Zealand government introduces a domestic carbon charge of US$30 a tonne of carbon equivalent.
4	As in scenario 2 but the New Zealand government introduces a domestic carbon charge of US$30 a tonne of carbon equivalent.
5	The Kyoto Protocol is implemented as in scenario 1 but the New Zealand government exposes all industries except iron and steel and nonferrous metals to the global carbon charge. The iron and steel and nonferrous metals industries do not face any carbon charge.

Key modeling results

A summary of key macroeconomic results for New Zealand under each scenario is presented in table 2. A more detailed set of macroeconomic and sectoral results for New Zealand is contained in the file 'Data for NZ contract3.xls', which has been included with this file.

Table 2: Key results for New Zealand at 2010 under each scenario

Scenario	Global carbon charge US$/t C	Domestic carbon charge US$/t C	Net quota income US$m	Quota sales Mt CO_2 equiv.	Domestic abatement [a] Mt CO_2 equiv.	Real GDP % diff. from ref. case	Real GNP % diff. from ref. case	Additional consumption tax [b] %
1	110.7	0.0	114.0	3.8	22.3	0.02	0.39	0.00
2	111.0	0.0	112.9	3.7	22.3	0.00	0.34	0.85

3	110.3	30.0	164.2	5.5	24.0	0.00	0.43	0.00
4	110.6	30.0	163.0	5.4	24.0	–0.02	0.38	0.77
5	109.5	109.5	279.6	9.4	27.9	–0.08		0.00
							0.55	

a Includes reduction in net emissions from sequestration activities. **b** Implies that final domestic consumption in New Zealand must be taxed by an additional amount equal to this rate to purchase the emission quota necessary to meet New Zealand's emission target. For example, the additional tax rate under scenario 2 of 0.85 per cent implies a tax on final consumption of 12.5 per cent would need to be raised to 13.46 per cent (1.1250*1.0085=1.1346).

- Under all scenarios New Zealand is a net seller of emission quota on the international emission quota market. The income received from emission quota sales is projected to increase real GNP in New Zealand above reference case levels at 2010 in all scenarios.

- Raising the level of the tax on final domestic consumption in New Zealand under scenarios 2 and 4 to purchase emission quota reduces both economic activity (real GDP) and national income (real GNP) in New Zealand relative to the levels projected in scenarios 1 and 3 respectively at 2010. Comparing real GNP under scenarios 2, 4 and 5 implies that taxing consumption in New Zealand in place of using a carbon charge to achieve New Zealand's Kyoto emission target will reduce national income in New Zealand.

- Introducing a domestic carbon charge in New Zealand in scenario 3 reduces real GDP in New Zealand but encourages increased domestic abatement in New Zealand relative to scenario 1. Likewise, raising the domestic carbon charge in scenario 5 reduces real GDP in New Zealand but increases domestic abatement relative to scenario 3.
  - In both scenarios 3 and 5, this increased domestic abatement enables New Zealand to sell more emission quota to the international market and receive a higher value for their emission quota.
  - In scenarios 1, 3 and 5 real GNP in New Zealand increases in line with the amount of emission quota New Zealand sells on the international market.

- The reduction in economic activity in New Zealand from scenario 1 to 3 and from scenario 3 to 5 occurs as production in energy intensive sectors, particularly iron and steel and nonferrous metals production, falls as a result of rising electricity costs, which, in turn, are caused by the rising domestic carbon charge. This causes both real wages and the rate of return to capital in New Zealand fall in scenario 3 relative to scenario 1 and in scenario 5 relative to scenario 3. As real wages and costs of capital fall in New Zealand, less energy intensive sectors, such as light manufacturing and services, are projected to experience small output rises and falling supply prices.

- The expansion in production of less energy intensive sectors in New Zealand from scenario 1 to 3 and from scenario 3 to 5 occurs at the expense of imported substitutes, which do not experience these supply price falls. As the use of domestic products rises when domestic supply prices fall, total imports in New Zealand fall from scenarios 1 to 3 and from scenarios 3 to 5. These less energy intensive industries constitute a significant proportion of New Zealand's imports.

- In scenario 1, the production of iron and steel and nonferrous metals in New Zealand rises relative to the reference case as New Zealand producers, who are not exposed to the carbon charge, can produce these products more cheaply than their competitors in countries that are exposed to the carbon charge. As mentioned previously, this cost advantage is eroded in scenario 3 and production of these products falls relative to scenario 1. Under scenario 5 the production of these products in New Zealand is projected to fall further than under scenario 3 as the costs of key inputs to production, notably electricity, rise

significantly. This decline occurs despite the iron and steel and nonferrous metals industries being exempt from the carbon charge.

- Total exports from New Zealand are projected to fall from scenario 1 to 3 and from scenario 3 to 5 as rising real GNP leads consumers in New Zealand to demand a greater share of domestic production. This fall is augmented by the reduction in exports of iron and steel and nonferrous metal products, which occurs as their supply prices rise above scenario 1 levels because of rising electricity costs and production in both these sectors is reduced from scenarios 1 to 3 and from scenarios 3 to 5.

Macroeconomic variable results for New Zealand for each scenario relative to the reference case at 2010.

		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
The carbon market						
Carbon charge	US$/t C	110.7	111.0	110.3	110.6	109.5
Net quota income	US$m	114.0	112.9	164.2	163.0	279.6
Net quota sales	Mt CO_2 equiv.	3.8	3.7	5.5	5.4	9.4
Domestic abatement	Mt CO_2 equiv.	22.3	22.3	24.0	24.0	27.9
Economic impact relative to the reference case						
Real GDP	%	0.02	0.00	0.00	-0.02	-0.08
Real GNP	%	0.39	0.34	0.43	0.38	0.55
Exchange rate	%	0.00	0.71	0.01	0.65	0.25
Exports	%	-0.55	-0.36	-0.72	-0.55	-1.10
Imports	%	0.35	0.26	0.30	0.22	0.28
Savings	%	0.39	1.05	0.44	1.04	0.81
Investment	%	0.11	0.09	0.08	0.06	-0.02
Export price index	%	0.04	-0.01	0.06	0.02	0.13
Import price index	%	-0.03	-0.04	-0.03	-0.04	-0.03
Terms of trade	%	0.07	0.03	0.09	0.05	0.16
Real wage	%	0.03	-0.83	-0.36	-1.14	-1.33
Nominal wage	%	0.00	-0.67	-0.39	-0.99	-1.36
Rate of return on capital	%	0.03	-0.02	-0.50	-0.54	-1.56
Additional tax applied to final domestic consumption in New Zealand at 2010	%	0.00	0.85	0.00	0.77	0.00

Percentage change in New Zealand emissions by sector under each scenario at 2010, relative to the reference case.

Scenario 1 - New Zealand does not introduce a carbon charge

	Coal combustion %	Gas combustion %	Petroleum and coal products combustion %	Noncombustion carbon dioxide %	Methane %	Nitrous oxide %	Total emissions %
Coal	..	-3.3	-3.1	..	-3.8	..	-2.9
Oil	..	..	..	-0.9	-1.8	..	-1.0
Gas	..	..	..	0.5	-0.4	..	0.0
Petroleum and coal products	..	-0.2	0.0	..	..	..	-0.2
Electricity	4.5	2.4	3.6	..	..	..	3.0
Iron and steel	5.7	..	5.7	..	..	..	5.7
Nonferrous metals	4.6	..	3.9	3.7	..	..	4.1
Chemicals, rubber and plastic	..	0.0	0.3	..	..	..	0.2
Clothing	..	..	..	..	..	..	..
Meat products	0.3	..	..	..	..	..	0.3
Dairy products	0.1	..	-0.7	..	..	..	0.0
Food	0.7	..	-0.1	..	..	..	0.6
Pulp, paper and publishing	..	..	..	..	..	..	..
Other wood products	..	..	..	..	..	..	..
Minerals	..	..	..	..	..	..	..
Nonmetallic minerals	1.2	..	0.4	0.4	..	..	0.7
Light manufacturing	..	..	..	..	..	..	..
Other manufacturing	..	..	..	..	..	..	..
Construction	..	0.0	0.3	..	..	..	0.0
Trade and transport	..	-0.3	-0.1	..	..	-0.1	-0.1
Private services	..	..	0.2	..	..	..	0.1
Public services	1.2	0.2	0.4	..	..	..	0.6
Other services	..	..	..	..	..	..	..
Rice	..	..	..	..	..	..	..
Wheat	..	..	-0.2	..	..	-0.3	-0.3
Other cereal grains	..	..	-0.1	..	..	-0.2	-0.2

Crops	..	..	0.3	..	..	0.2	0.2
Forestry	..	..	0.0	..	..	..	0.0
Fisheries	..	..	0.0	..	..	..	0.0
Cattle	..	..	-0.2	..	-0.3	-0.3	-0.3
Other animal products	..	..	0.5	..	0.4	0.4	0.4
Dairy cattle	..	..	-0.5	..	-0.8	-0.7	-0.7
Wool	..	..	-0.1	..	-0.3	-0.2	-0.3

Scenario 2 - New Zealand does not introduce a carbon charge but increases GST to purchase necessary sinks credits for compliance

	Coal combustion %	Gas combustion %	Petroleum and coal products combustion %	Noncombustion carbon dioxide %	Methane %	Nitrous oxide %	Total emissions %
Coal	..	-3.2	-3.0	..	-3.8	..	-2.9
Oil	..	..	..	-0.9	-1.8	..	-0.9
Gas	..	..	..	0.6	-0.3	..	0.0
Petroleum and coal products	..	-0.2	0.0	..	..	..	-0.1
Electricity	4.6	2.4	3.6	..	..	..	3.0
Iron and steel	5.9	..	5.9	..	..	..	5.9
Nonferrous metals	4.9	..	4.1	4.0	..	..	4.4
Chemicals, rubber and plastic	..	0.1	0.3	..	..	..	0.3
Clothing	..	..	..	..	..	..	..
Meat products	0.4	..	..	..	..	..	0.4
Dairy products	0.2	..	-0.5	..	..	..	0.1
Food	0.7	..	0.0	..	..	..	0.7
Pulp, paper and publishing	..	..	..	..	..	..	..
Other wood products	..	..	..	..	..	..	..
Minerals	..	..	..	..	..	..	..
Nonmetallic minerals	1.2	..	0.4	0.4	..	..	0.7
Light manufacturing	..	..	..	..	..	..	..
Other manufacturing	..	..	..	..	..	..	..
Construction	..	0.0	0.2	..	..	..	0.0
Trade and transport	..	-0.3	-0.1	..	..	-0.1	-0.1

Private services	..	..	0.1	..	..	..	0.1
Public services	1.0	0.1	0.3	..	..	..	0.5
Other services	..	..	..	..	..	..	..
Rice	..	..	..	..	..	..	..
Wheat	..	..	-0.1	..	..	-0.2	-0.2
Other cereal grains	..	..	0.0	..	..	-0.1	-0.1
Crops	..	..	0.3	..	..	0.2	0.2
Forestry	..	..	0.1	..	..	..	0.1
Fisheries	..	..	0.1	..	..	..	0.1
Cattle	..	..	-0.1	..	-0.3	-0.2	-0.3
Other animal products	..	..	0.5	..	0.3	0.4	0.4
Dairy cattle	..	..	-0.4	..	-0.6	-0.5	-0.6
Wool	..	..	-0.1	..	-0.3	-0.2	-0.2

Scenario 3 - New Zealand introduces a US$30 carbon charge

	Coal combustion %	Gas combustion %	Petroleum and coal products combustion %	Noncombustion carbon dioxide %	Methane %	Nitrous oxide %	Total emissions %
Coal	..	-9.2	-5.3	..	-8.8	..	-7.0
Oil	..	..	..	-0.3	-1.9	..	-0.4
Gas	..	..	..	-1.7	-3.3	..	-2.7
Petroleum and coal products	..	-9.6	-0.7	..	..	..	-8.0
Electricity	-10.2	-3.0	-48.1	..	..	..	-5.8
Iron and steel	-5.0	..	-5.0	..	..	..	-5.0
Nonferrous metals	-10.2	..	0.4	-3.9	..	..	-6.5
Chemicals, rubber and plastic	..	-0.3	0.3	..	..	..	0.2
Clothing	..	..	..	..	..	..	..
Meat products	-10.3	..	..	..	..	..	-10.3
Dairy products	-9.8	..	0.0	..	..	..	-8.5
Food	-9.8	..	0.8	..	..	..	-9.5
Pulp, paper and publishing	..	..	..	..	..	..	..
Other wood products	..	..	..	..	..	..	..

Minerals	..	..	..	..	..	..	..
Nonmetallic minerals	-7.6	..	2.8	0.2	..	..	-3.0
Light manufacturing	..	..	..	..	..	..	..
Other manufacturing	..	..	..	..	..	..	..
Construction	..	-1.3	2.0	..	..	..	-1.2
Trade and transport	..	0.1	-0.3	..	..	-0.1	-0.3
Private services	..	..	-0.5	..	..	..	-0.5
Public services	-0.5	-2.3	0.0	..	..	..	-1.0
Other services	..	..	..	..	..	..	..
Rice	..	..	..	..	..	..	..
Wheat	..	..	-2.4	..	..	-0.2	-0.6
Other cereal grains	..	..	-2.3	..	..	-0.1	-0.5
Crops	..	..	-1.9	..	..	0.3	0.0
Forestry	..	..	-1.6	..	..	..	-1.5
Fisheries	..	..	-1.4	..	..	..	-1.4
Cattle	..	..	-2.1	..	-0.3	-0.2	-0.3
Other animal products	..	..	-1.4	..	0.3	0.4	0.2
Dairy cattle	..	..	-2.7	..	-0.7	-0.6	-0.7
Wool	..	..	-2.1	..	-0.2	-0.2	-0.2

Scenario 4 - New Zealand introduces a US$30 carbon charge but increases GST to purchase necessary sinks credits for compliance

	Coal combustion	Gas combustion	Petroleum and coal products combustion	Noncombustion carbon dioxide	Methane	Nitrous oxide	Total emissions
	%	%	%	%	%	%	%
Coal	..	-9.1	-5.3	..	-8.7	..	-7.0
Oil	..	..	..	-0.2	-1.8	..	-0.3
Gas	..	..	..	-1.7	-3.3	..	-2.7
Petroleum and coal products	..	-9.6	-0.7	..	..	..	-8.0
Electricity	-10.1	-2.9	-48.2	..	..	..	-5.7
Iron and steel	-4.8	..	-4.8	..	..	..	-4.8
Nonferrous metals	-9.9	..	0.6	-3.6	..	..	-6.3
Chemicals, rubber and plastic	..	-0.3	0.4	..	..	..	0.3

Clothing	..	..	..	..	..	..	..
Meat products	-10.2	..	..	..	..	..	-10.2
Dairy products	-9.6	..	0.1	..	..	..	-8.4
Food	-9.7	..	0.8	..	..	..	-9.4
Pulp, paper and publishing	..	..	..	..	..	..	..
Other wood products	..	..	..	..	..	..	..
Minerals	..	..	..	..	..	..	..
Nonmetallic minerals	-7.6	..	2.8	0.3	..	..	-3.0
Light manufacturing	..	..	..	..	..	..	..
Other manufacturing	..	..	..	..	..	..	..
Construction	..	-1.3	2.0	..	..	..	-1.2
Trade and transport	..	0.1	-0.3	..	..	-0.1	-0.3
Private services	..	..	-0.5	..	..	..	-0.5
Public services	-0.6	-2.3	-0.1	..	..	..	-1.1
Other services	..	..	..	..	..	..	..
Rice	..	..	..	..	..	..	..
Wheat	..	..	-2.4	..	..	-0.2	-0.5
Other cereal grains	..	..	-2.3	..	..	-0.1	-0.4
Crops	..	..	-1.9	..	..	0.3	0.0
Forestry	..	..	-1.5	..	..	..	-1.4
Fisheries	..	..	-1.4	..	..	..	-1.4
Cattle	..	..	-2.1	..	-0.2	-0.2	-0.3
Other animal products	..	..	-1.4	..	0.3	0.4	0.2
Dairy cattle	..	..	-2.6	..	-0.5	-0.4	-0.6
Wool	..	..	-2.1	..	-0.2	-0.1	-0.2

Scenario 5 - New Zealand excludes the iron and steel introduces a US$30 carbon charge

	Coal combustion %	Gas combustion %	Petroleum and coal products combustion %	Noncombustion carbon dioxide %	Methane %	Nitrous oxide %	Total emissions %
Coal	..	-20.5	-11.0	..	-25.7	..	-19.2
Oil	..	..	..	0.1	-3.6	..	-0.2

Gas	..	..	..	-5.6	-9.1	..	-7.7
Petroleum and coal products	..	-22.7	-2.5	..	..	..	-19.1
Electricity	-31.6	-11.2	-78.3	..	..	..	-18.1
Iron and steel	-11.7	..	-11.7	..	..	..	-11.7
Nonferrous metals	0.5	..	-0.3	-14.8	..	..	-8.2
Chemicals, rubber and plastic	..	-2.4	0.0	..	..	..	-0.4
Clothing	..	..	..	..	..	..	..
Meat products	-21.6	..	..	..	..	..	-21.5
Dairy products	-21.5	..	0.9	..	..	..	-18.7
Food	-21.2	..	2.7	..	..	..	-20.5
Pulp, paper and publishing	..	..	..	..	..	..	..
Other wood products	..	..	..	..	..	..	..
Minerals	..	..	..	..	..	..	..
Nonmetallic minerals	-17.1	..	7.4	-4.4	..	..	-9.6
Light manufacturing	..	..	..	..	..	..	..
Other manufacturing	..	..	..	..	..	..	..
Construction	..	-3.9	6.2	..	..	..	-3.8
Trade and transport	..	0.2	-1.0	..	..	-0.2	-1.0
Private services	..	..	-1.8	..	..	..	-1.6
Public services	-3.9	-6.8	-0.6	..	..	..	-4.1
Other services	..	..	..	..	..	..	..
Rice	..	..	..	..	..	..	..
Wheat	..	..	-6.4	..	..	-28.3	-24.4
Other cereal grains	..	..	-6.3	..	..	-28.2	-24.3
Crops	..	..	-5.4	..	..	-27.6	-23.8
Forestry	..	..	-4.4	..	..	..	-4.1
Fisheries	..	..	-4.0	..	..	..	-3.9
Cattle	..	..	-5.7	..	-3.1	-0.4	-2.6
Other animal products	..	..	-4.7	..	-2.4	0.3	-2.3
Dairy cattle	..	..	-7.1	..	-5.6	-1.0	-4.1
Wool	..	..	-5.5	..	-2.8	-0.1	-2.2

Percentage change in sectoral output, employment, exports, imports and supply prices in New Zealand relative to the reference case at 2010 for each scenario.

Scenario 1 - No carbon charge in New Zealand

	Output	Employment	Exports	Imports	Supply prices
Coal	-2.8	-4.4	-11.1	..	-4.0
Oil	-0.9	-1.3	-2.9	0.1	-0.6
Gas	0.5	0.7	..	..	0.8
Petroleum and coal products	0.1	0.1	0.2	0.3	-0.4
Electricity	1.1	0.8	..	..	0.9
Iron and steel	5.6	5.5	8.3	-4.1	0.9
Nonferrous metals	3.7	3.8	1.7	-6.4	1.3
Chemicals, rubber and plastic	0.2	0.2	0.7	0.0	0.0
Clothing	-0.3	-0.2	-1.0	0.3	-0.1
Meat products	-0.6	-0.5	-1.3	1.5	0.0
Dairy products	-0.8	-0.8	-0.9	1.1	-0.1
Food	-0.3	-0.2	-0.5	1.0	0.0
Pulp, paper and publishing	-0.1	0.0	-0.1	0.2	0.0
Other wood products	-0.5	-0.5	-1.7	1.2	0.1
Minerals	0.8	0.9	-0.2	0.5	0.4
Nonmetallic minerals	0.4	0.4	1.8	-1.1	0.1
Light manufacturing	-0.9	-0.8	-1.7	0.5	0.2
Other manufacturing	-1.2	-1.1	-1.7	0.4	0.2
Construction	0.1	0.1	-1.7	0.7	0.1
Trade and transport	-0.1	-0.1	-1.2	0.9	0.0
Private services	0.0	0.0	-1.4	0.7	0.0
Public services	0.3	0.3	-1.3	1.7	0.0
Other services	0.4	0.5	..	..	0.1
Rice	..	..	..	..	..
Wheat	-0.3	-0.3	..	0.0	-0.1
Other cereal grains	-0.2	-0.2	0.6	-0.4	-0.1
Crops	0.2	0.1	0.3	-0.2	-0.1
Forestry	-0.1	-0.1	0.1	..	0.0
Fisheries	0.0	-0.1	0.7	-0.8	-0.1
Livestock for meat	-0.3	-0.3	0.2	0.1	-0.1
Other animal products	0.4	0.4	0.4	-0.4	0.0
Dairy cattle	-0.7	-0.7	..	..	-0.1
Wool	-0.2	-0.3	-0.1	-0.4	-0.2

Scenario 2 - New Zealand does not introduce a carbon charge but increases GST to purchase necessary sinks credits for compliance

	Output	Employment	Exports	Imports	Supply prices
Coal	-2.7	-4.3	-11.2	..	-4.6
Oil	-0.9	-1.3	-2.9	0.1	-1.3
Gas	0.6	0.8	..	..	0.0
Petroleum and coal products	0.1	0.1	0.3	0.3	-1.1
Electricity	1.1	0.8	..	..	0.2
Iron and steel	5.7	5.7	8.5	-3.9	0.1
Nonferrous metals	4.0	4.0	2.0	-6.4	0.5
Chemicals, rubber and plastic	0.3	0.3	0.9	-0.1	-0.7
Clothing	-0.2	-0.2	-0.8	0.2	-0.8
Meat products	-0.5	-0.4	-1.0	1.3	-0.8
Dairy products	-0.6	-0.6	-0.7	1.1	-0.8
Food	-0.2	-0.2	-0.3	0.9	-0.8
Pulp, paper and publishing	0.0	0.0	0.1	0.1	-0.7
Other wood products	-0.4	-0.4	-1.4	1.0	-0.7
Minerals	0.9	1.0	-0.1	0.5	-0.3
Nonmetallic minerals	0.4	0.4	2.0	-1.2	-0.6
Light manufacturing	-0.7	-0.7	-1.4	0.4	-0.5
Other manufacturing	-1.0	-1.0	-1.4	0.3	-0.6
Construction	0.1	0.1	-1.5	0.6	-0.7
Trade and transport	-0.1	-0.1	-1.0	0.7	-0.8
Private services	0.0	0.0	-1.1	0.6	-0.7
Public services	0.2	0.2	-1.0	1.5	-0.7
Other services	0.3	0.3	..	..	-0.7
Rice	..	..	..	..	..
Wheat	-0.2	-0.3	..	0.1	-0.8
Other cereal grains	-0.1	-0.2	0.6	-0.4	-0.8
Crops	0.2	0.1	0.3	-0.2	-0.8
Forestry	0.0	0.0	0.1	..	-0.7
Fisheries	0.0	0.0	0.6	-0.7	-0.8
Livestock for meat	-0.2	-0.2	0.2	0.1	-0.8
Other animal products	0.4	0.4	0.4	-0.3	-0.8
Dairy cattle	-0.5	-0.6	..	..	-0.8
Wool	-0.2	-0.2	-0.1	-0.3	-0.9

Simulation 3 - Introducing a US$30 carbon charge in New Zealand

	Output	Employment	Exports	Imports	Supply prices
Coal	-6.5	-9.7	-6.8	..	-5.0
Oil	-0.3	-0.4	-0.8	-1.0	-1.0
Gas	-1.7	-2.4	..	..	-1.7
Petroleum and coal products	-0.7	-0.7	-0.3	0.1	-0.2
Electricity	-1.3	-0.7	..	..	5.0
Iron and steel	-3.6	-3.5	-7.9	-0.8	4.1
Nonferrous metals	-1.3	-1.3	-4.6	-7.4	2.5
Chemicals, rubber and plastic	0.2	0.3	0.7	0.0	0.0
Clothing	0.0	0.0	-0.5	0.3	-0.1
Meat products	-0.7	-0.6	-1.5	1.5	0.0
Dairy products	-0.7	-0.7	-0.8	1.1	-0.1
Food	-0.1	-0.1	-0.1	0.8	-0.1
Pulp, paper and publishing	0.2	0.2	0.4	0.1	-0.1
Other wood products	-0.5	-0.5	-1.8	1.2	0.1
Minerals	0.1	0.1	0.7	-1.1	0.2
Nonmetallic minerals	0.2	0.3	1.0	-0.7	0.3
Light manufacturing	-0.9	-0.9	-1.7	0.5	0.2
Other manufacturing	-0.8	-0.8	-1.2	0.4	0.1
Construction	0.1	0.1	-1.8	0.8	0.1
Trade and transport	-0.1	-0.1	-1.0	0.8	-0.1
Private services	0.1	0.1	-0.4	0.3	-0.2
Public services	0.5	0.5	-0.6	1.5	-0.2
Other services	0.6	0.6	..	..	-0.2
Rice	..	..	..	..	..
Wheat	-0.2	-0.2	..	0.0	-0.2
Other cereal grains	-0.1	-0.1	0.8	-0.4	-0.2
Crops	0.3	0.3	0.5	-0.2	-0.1
Forestry	0.2	0.2	0.5	..	-0.1
Fisheries	0.0	0.1	0.4	-0.4	-0.1
Livestock for meat	-0.2	-0.2	0.2	0.2	-0.1
Other animal products	0.4	0.4	0.4	-0.3	0.0
Dairy cattle	-0.6	-0.6	..	..	-0.1
Wool	-0.2	-0.2	0.0	-0.3	-0.2

Scenario 4 - New Zealand introduces a US$30 carbon charge but increases GST to purchase necessary sinks credits for compliance

	Output	Employment	Exports	Imports	Supply prices
Coal	-6.4	-9.6	-6.8	..	-5.6
Oil	-0.2	-0.4	-0.8	-1.0	-1.7
Gas	-1.7	-2.3	..	..	-2.3
Petroleum and coal products	-0.7	-0.7	-0.3	0.1	-0.9
Electricity	-1.2	-0.7	..	..	4.3
Iron and steel	-3.4	-3.3	-7.7	-0.7	3.4
Nonferrous metals	-1.1	-1.1	-4.3	-7.3	1.8
Chemicals, rubber and plastic	0.3	0.3	0.8	0.0	-0.7
Clothing	0.0	0.0	-0.3	0.1	-0.8
Meat products	-0.6	-0.6	-1.3	1.4	-0.7
Dairy products	-0.5	-0.5	-0.6	1.1	-0.7
Food	0.0	0.0	0.0	0.7	-0.8
Pulp, paper and publishing	0.2	0.2	0.5	0.0	-0.8
Other wood products	-0.5	-0.4	-1.6	1.0	-0.6
Minerals	0.1	0.2	0.8	-1.1	-0.5
Nonmetallic minerals	0.3	0.3	1.2	-0.8	-0.4
Light manufacturing	-0.8	-0.8	-1.4	0.4	-0.5
Other manufacturing	-0.6	-0.6	-0.9	0.3	-0.6
Construction	0.1	0.1	-1.6	0.7	-0.6
Trade and transport	-0.1	-0.1	-0.8	0.7	-0.8
Private services	0.1	0.1	-0.2	0.2	-0.9
Public services	0.4	0.4	-0.4	1.4	-0.8
Other services	0.5	0.4	..	..	-0.9
Rice	..	..	..	..	..
Wheat	-0.2	-0.2	..	0.0	-0.8
Other cereal grains	-0.1	0.0	0.8	-0.4	-0.8
Crops	0.3	0.3	0.5	-0.2	-0.8
Forestry	0.2	0.3	0.5	..	-0.8
Fisheries	0.1	0.1	0.3	-0.4	-0.7
Livestock for meat	-0.2	-0.2	0.2	0.2	-0.8
Other animal products	0.4	0.4	0.4	-0.2	-0.7
Dairy cattle	-0.4	-0.4	..	..	-0.7
Wool	-0.1	-0.1	-0.1	-0.3	-0.8

Simulation 5 - Excluding the iron and steel and non-ferrous metals sectors in New Zealand from the carbon charge

	Output	Employment	Exports	Imports	Supply prices
Coal	-14.8	-20.0	-12.7	..	-3.8
Oil	0.1	0.0	1.8	-3.1	-1.8
Gas	-5.6	-7.3	..	..	-4.4
Petroleum and coal products	-2.6	-2.6	-2.4	-0.1	0.1
Electricity	-4.4	-2.3	..	..	17.8
Iron and steel	-12.1	-12.1	-24.1	4.7	7.8
Nonferrous metals	-2.3	-2.3	-5.1	-8.6	2.3
Chemicals, rubber and plastic	-0.2	-0.2	-0.2	0.1	0.1
Clothing	0.3	0.3	-0.1	0.2	-0.4
Meat products	-1.5	-1.4	-3.2	1.8	0.0
Dairy products	-1.2	-1.2	-1.4	1.1	-0.2
Food	0.0	0.0	0.1	0.7	-0.4
Pulp, paper and publishing	0.3	0.3	0.6	0.0	-0.4
Other wood products	-1.2	-1.1	-3.8	2.1	0.3
Minerals	-1.1	-1.1	-0.4	-1.8	0.2
Nonmetallic minerals	-0.3	-0.3	-2.2	0.6	0.7
Light manufacturing	-0.7	-0.8	-1.2	0.3	-0.1
Other manufacturing	-0.1	-0.1	-0.4	0.5	-0.3
Construction	0.0	0.0	-2.9	1.3	0.2
Trade and transport	-0.2	-0.2	-1.4	1.0	-0.2
Private services	0.3	0.2	1.0	-0.3	-0.8
Public services	0.9	0.9	0.0	1.3	-0.6
Other services	1.0	0.9	..	..	-0.9
Rice	..	..	..	..	..
Wheat	-0.4	-0.4	..	-0.4	-0.5
Other cereal grains	-0.2	-0.2	1.3	-0.8	-0.5
Crops	0.6	0.7	1.0	-0.5	-0.5
Forestry	0.4	0.5	1.2	..	-0.5
Fisheries	0.1	0.2	0.3	-0.3	-0.3
Livestock for meat	-0.4	-0.4	0.2	0.1	-0.4
Other animal products	0.3	0.4	0.3	-0.6	-0.3
Dairy cattle	-1.0	-1.0	..	..	-0.2
Wool	-0.1	-0.1	0.4	-0.6	-0.5